

UNCLASSIFIED

AD NUMBER

ADB022526

LIMITATION CHANGES

TO:

Approved for public release; distribution is unlimited.

FROM:

Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; 12 AUG 1977. Other requests shall be referred to Electronics Systems Division, Attn: AFSC, Hanscom AFB, MA.

AUTHORITY

USAFGL ltr, 7 Sep 1982

THIS PAGE IS UNCLASSIFIED

AD B 022526

AUTHORITY:

USAFGL

1tr, 7 Sep 82



100-11-77-314



(12)

Report No. 131500-617
12 August 1977

(2 MG)

AD B 022526

SAND AND DUST TEST REPORT
FOR THE
AN/TRN-41 TACAN NAVIGATIONAL SET

Distribution limited to U. S. Government agencies only;
Reason: Test and Evaluation. 12 August 1977. Other
requests for this document must be referred to
Department of the Air Force, Headquarters Electronic
Systems Division (AFSC), Hanscom Air Force Base,
Massachusetts 01731, Attention: PEG.

DDC
RECEIVED
NOV 3 1977
F

Prepared for:
Department of the Air Force
Headquarters Electronic Systems Division (AFSC)
Hanscom Air Force Base
Massachusetts 01731

Prepared by:
✓ E-Systems, Inc., Montek Division
2268 South 3270 West
Salt Lake City, Utah 84119

Contract No. F19628-75-C-0200
CDRL Item A00Y

AD No. _____
DDC FILE COPY

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|--|-----------------------|--|
| 1. REPORT NUMBER ESD-TR-77-314 (18) | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle) Sand and Dust Test Report for the AN/TRN-41 TACAN Navigational Set. (6) | | 5. TYPE OF REPORT & PERIOD COVERED |
| 7. AUTHOR(s) NONE | | 6. PERFORMING ORG. REPORT NUMBER (14) 131500-617 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS E-Systems Inc., Montek Division 2268 South 3270 West Salt Lake City, Utah 84119 | | 8. CONTRACT OR GRANT NUMBER(s) (15) F19628-75-C-0200 |
| 11. CONTROLLING OFFICE NAME AND ADDRESS Electronic Systems Division (AFSC) Hanscom AFB, MA 01731 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) | | 12. REPORT DATE 12 August 1977 (11) |
| | | 13. NUMBER OF PAGES (12) 12p. |
| | | 15. SECURITY CLASS. (of this report) Unclassified |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A |
| 16. DISTRIBUTION STATEMENT (of this Report) Distribution Limited to U.S. Government agencies only; Reason: Test and Evaluation. 12 August 1977. Other requests for this document must be referred to Department of the Air Force, Headquarters Electronic Systems Division (AFSC) Hanscom AFB, MA 01731 Attention: DRI | | |
| 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) | | |
| 18. SUPPLEMENTARY NOTES | | |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number) AN/TRN-41 TACAN Navigational Set | | |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report describes the sand and dust test as defined in the Equipment Test Plan for Navigational Set, TACAN, AN/TRN-41. 408354 B | | |

SAND AND DUST TEST REPORT
for the
NAVIGATIONAL SET, TACAN, AN/TRN-41

This report describes the sand and dust test as defined in the Equipment Test Plan for Navigational Set, TACAN, AN/TRN-41, 131500-415.

1. **Test Identification.** Sand and dust test as defined in Appendix IV-D (sand and dust test procedure) of the Equipment Test Plan for Navigational Set, TACAN, AN/TRN-41.
2. **Functional Purpose of Test.** This test forms a part of the AN/TRN-41 system qualification tests.
3. **Test Objectives.** To demonstrate that the AN/TRN-41 will meet the sand and dust requirements of paragraphs 3.2.5.1.4 and 4.2.1.4.3.5 of Specification No. 404L-701-5017A, Part 1 of 2 parts (20 August 1976).
4. **Description of Test Article.** The AN/TRN-41 system consisting of the following was used for the tests:

| | |
|------------------------|-----------|
| Receiver-Transmitter | RT-1202/T |
| Antenna | AS-3132/T |
| Antenna Support | AB-1237/T |
| Filter, DC Power | F-1439/T |
| Interconnecting Cables | |

| | | | | | | | | |
|---------------|------|--------------------------------------|---|--------------------------------------|----|---------------------------------|---|---------|
| ACCESSION for | NTIS | W e Section <input type="checkbox"/> | B e Section <input checked="" type="checkbox"/> | D C Section <input type="checkbox"/> | BY | DISTRIBUTION/AVAILABILITY CODES | D | SPECIAL |
| | DDC | UNCLASSIFIED | RESTRICTED | CONFIDENTIAL | | | | |
| B | | | | | | | | |

5. **Summary of Test Results.** The AN/TRN-41 showed no functional or physical degradation during the sand and dust test.
6. **Description of Test Facilities and Procedures.** The test facilities and test procedures are described in Appendix IV-D of the Equipment Test Plan.
7. **Test Setup Diagrams.** The test setup diagrams are provided in Appendix IV-D of the Equipment Test Plan.

8. **Test Equipment.** See Attachment 1 for test equipment used for the sand and dust test and the pretest and post test operational tests.

9. **Test Data.** Attachment 2 contains test data for the sand and dust test. This data includes:

- a. Environmental Test Data Sheet
- b. Operational Test Data Sheet, (pretest and post test)
- c. Chamber Data Sheet
- d. Photographs of AN/TRN-41 system after sand and dust test.

10. **Test Conditions.** The system was subjected to sand and dust as described in Appendix IV-D of the equipment test plan.

11. **Test Results Analysis.** The system functioned normally during and after the sand and dust test. Visual inspection revealed some dust in the antenna, RT and DC power filter as noted in the data sheet in Attachment 2. The dust as noted did not affect the functional operation of the system.

12. **Certification.** The data sheets shown in Attachment 2 have been signed by a Montek Quality Assurance representative and a DCAS representative, certifying that the test results are authentic, accurate, current and in accordance with the related test plan.

ATTACHMENT 1
TEST EQUIPMENT

TEST EQUIPMENT

| <u>Description/Manufacturer</u> | <u>Model</u> | <u>Calibration Due Date</u> |
|--|--------------|-----------------------------|
| Oscilloscope, Tektronix | 465 | 7/6/77 |
| Signal Generator, RF, H.P. | 612A | 6/23/77 |
| Peak Power Meter, HP | 8900B | 9/19/77 |
| Pulse Generator, Data Pulse | 110B | 5/12/77 |
| Counter, Fluke | 1953 | 8/12/77 |
| Half-Ampl. Det. Montek | 131500-702 | N/A |
| RF Detector, Montek | 135203-100 | N/A |
| Monitor Ant., Montek | 006300 | N/A |
| Test Box - Interconnection - Montek | 131500-703 | N/A |
| Power Supply HP | 6274B | 1/16/78 |
| Power Supply Acopian | | 12/9/77 |
| Power Supply, Sorensen | QR4075A | 9/19/77 |
| Directional Coupler 20 dB, Narda | 3042B | 2/13/78 |
| Directional Coupler 10 dB, Microlab | CBA-78 | N/A |
| Variable Attenuator, Weinschel 0-10 dB | 905 | 12/13/77 |
| RF Attenuator, Weinschel | 10 dB | N/A |
| Multimeter, Fluke | 8120A | 8/2/77 |
| Sand and Dust Chamber, Hiatt Eng. | SDHL-96 | 7/15/77 |

ATTACHMENT 2
DATA SHEETS

APPENDIX IV-K
DATA SHEET
ENVIRONMENTAL TEST

131500-415

June 30, 1976

TEST Sand And Dust
SYSTEM 002

from 9 May 1977
DATE to 13 May 1977
ACCEPTABLE X
NOT ACCEPTABLE _____

REMARKS System Serial No. 002 was subjected to Sand and Dust Testing as outlined by Appendix IV-D of Equipment Test Plan 131500-415. The system functioned normally upon completion of the test. The following was observed during visual-mechanical inspection:
Antenna--There was a very thin layer of dust on the inner diameter of the 135HZ element, P/N 131062-100. There was no evidence of any dust leakage on the o-ring seal area. Suspect dust entered through the pressure relief valve due to temperature changes required during the test. There was a very thin film of dust on the RF gasket of the Speed Control Assembly Cover, P/N 131009-001, between all mounting screws. There was dust on the interior of the Drive Unit Cover, P/N 131019-001. There was a very minor indication of dust at one place on the machined flange of the Bottom Bearing Plate (Motor), P/N 131003-001. Even though dust was observed as noted above, it would not affect the functions and operations of the antenna .
Receiver-Transmitter--There was a very thin film of dust on the gasket of Channel Selector and Code Switch Cover, P/N 19156-131103-001. Even though a very thin layer of dust was observed, it would not affect the operation of the Receiver-Transmitter.
D.C. Power Filter--There was dust (1 tablespoon) on interior of enclosure. The dust entered this unit due to gasket bond failures and improper seal in a localized area. Even though dust was present, it would not affect the operation of the D.C. Power Filter.

SIGN OFF INFORMATION

ENVIRONMENTAL TEST ENGINEER _____ DATE _____

REPRESENTATIVE ENGINEER B.G. TAYLOR by JMR DATE 6/3/77

QA REPRESENTATIVE m. B. Lunt DATE 6/3/77

DCASD OR AF CONCURRENCE Thelma M. Lusk DATE 6-3-77

June 30, 1976

DATA SHEET
OPERATIONAL TESTS
AN/TRN-41

BEST AVAILABLE COPY

Test SAND & DUST

System 002

RT 003

ANT 001

DC 001

TRIPOD 002

Date 5/8/77

Time

Tech

| Para. No. | Description | Pre-Test | Test | Post-Test | Requirements | Units |
|-----------|--|----------------------------|------|---------------------------------|------------------------------------|--------------------|
| 6.1 | Calibrated RF insertion loss $P_L = 32.5$ dB Used in determining RF peak power. | N/A | N/A | N/A | N/A | N/A |
| 6.2 | System turn on normal operation | ✓ | | ✓ | Check if OK | N/A |
| 6.3.1 | Antenna radiated signal 15 Hz | ✓ | | ✓ | Check if OK | N/A |
| | 135 Hz | ✓ | | ✓ | Check if OK | N/A |
| 6.3.2 | Antenna Speed | 66.667 | | 66.667 | 66.667 ± .133 | ms |
| 6.4.1.1 | Correct identity code | ✓ | | ✓ | Check if OK | N/A |
| 6.4.1.2 | Identity period | 38.0 | 38.0 | 38.0 | 37.5 ± 3.75 | Seconds |
| 6.4.2 | Peak power (1) Reading of peak power meter $P_m =$ (2) Convert to dBm - 10 log $P_m \times 10^3 = P_m \text{ dBm}$ Total power output in dBm $P_{m \text{ dBm}} + P_L =$ *Insertion loss see 6.1 above. | 70.mw 18.45 50.95 | | 70.mw 18.45 dBm 50.95 dBm | N/A N/A 50 dBm | Watts dBm dB |
| 6.4.3.3 | Pulse count | 7190 | | 7215 | 7200 ± 180 | Counts |
| 6.4.4.2 | Pulse shape Width (50%) Rise time (10-90%) Fall time (90-10%) | 3.4 μs 2.0 μs 2.5 μs | | 3.4 μs 1.9 μs 2.5 μs | 3.5 ± 0.5 2 ± 0.25 2.5 ± 0.5 | μs μs μs |
| 6.4.4.4 | Pulse spacing | 12.0 μs | | 12.0 μs | 12.0 ± 0.1 | μs |
| 6.5.2 | Delay - 60 ± 10 μs 15 Hz trig to first burst pulse. | ✓ | | ✓ | Check if OK | |

June 30, 1976

DATA SHEET
OPERATIONAL TESTS
AN/TRN-41 (Continued)

| No. | Description | Pre Test | Test | Post Test | Requirements | Units |
|--------|--|----------|------|-----------|-----------------------------|-------|
| 4.5.3 | Correct north Burst - 12 pulse pairs spaced $30 \pm 0.1 \mu s$ | ✓ | | ✓ | Check if OK | |
| 4.5.5 | Delay $40 \pm 10 \mu s$ - 135 Hz trig to first burst pulse | ✓ | | ✓ | Check if OK | |
| 4.5.6 | Correct Aux burst - 6 pulse pairs spaced $24 \pm 0.1 \mu s$ | ✓ | | ✓ | Check if OK | |
| 4.6.5 | RT replies to 3300 interrogations | 2135 | | 2751 | ≥ 2310 (Counts/Second) | |
| 4.6.7 | Demand only mode - times to switch from ON to STBY within 70 seconds 80 | ✓ | | ✓ | Check if OK | ✓ |
| 4.6.8 | STBY mode | ✓ | | ✓ | Check if OK | |
| 4.6.9 | Demand Only mode - time to switch from STBY to ON ≤ 18 sec 20 | ✓ | | ✓ | Check if OK | |
| 4.6.10 | ON AIR mode | ✓ | | ✓ | Check if OK | |
| 4.7.1 | DME ONLY mode | ✓ | | ✓ | Check if OK | |
| 4.7.2 | Switch from DME to TACAN | ✓ | | ✓ | Check if OK | |
| 4.8.1 | Antenna Alarm - Within four seconds | ✓ | | ✓ | Check if OK | |
| 4.8.2 | Alarm Reset | ✓ | | ✓ | Check if OK | |
| 4.8.3 | RT Alarm - Within five seconds | ✓ | | ✓ | Check if OK | |
| 4.8.4 | Alarm Reset | ✓ | | ✓ | Check if OK | |

BEST AVAILABLE COPY

S + D

ENV. TECH. R K Davis

TEST SCHED.

ENGINEER OR Q.C. Al Rogers (L systems)

PHONE 973-4300 ex 288

TEST COMPLETED

TECHNICIAN

PHONE

TEST REMOVED

UNIT TITLE

SER.

QTY. /

TOTAL UTILIZATION

**INSTRUCTIONS
TO
OPERATOR**

TEST TO TERMINATE:

BY:

**ENVIRONMENTAL
LABORATORY
SUPERVISORS
APPROVAL**

1. Test per procedure 1.

TEST Sand + Dust

SPEC. Mil-std 810

PAR. Method 570.1

SIGNATURE

DATE _____

DATE _____

TIME

CHRONOLOGICAL RECORD OF TEST

INITIALS
(PRINT)

5/1/77

2

Set temperature to 13°F , $\text{R.H.} > 22\%$, Air velocity $1750 \text{ fpm} \pm 250$, dust density $.03 \pm .02 \text{ grams/ft}^3$.

Дел 3

5/0/77

16

stop dust feed, reduce velocity to 300 ± 200 fmin.
set Temp. to 145°F .

1249

5/1/77

i

increase air velocity to 1750 ± 200 fpm. adjust
dust density to 0.03 ± 0.02 grams/fl³

443

5/14/77

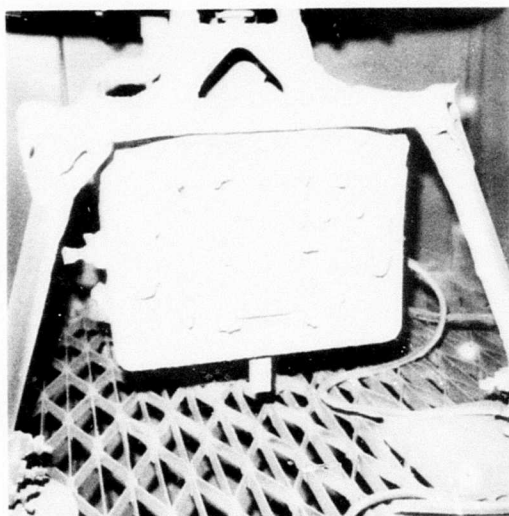
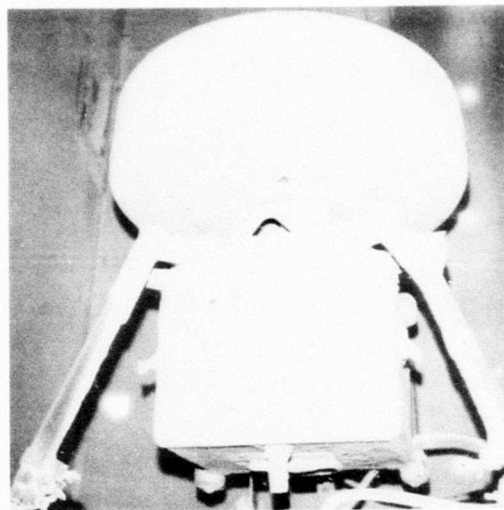
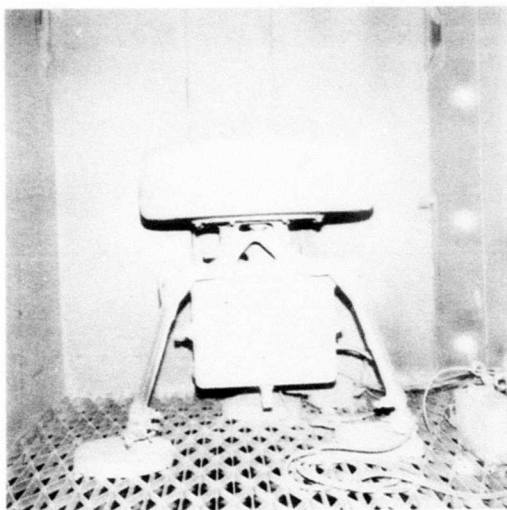
chamber-eff

BEST AVAILABLE COPY

VERIFIED & RELEASED BY:

Q.C. OR PROGRESS

COGNIZANT ENGINEER



AN/TRN-41 AFTER SAND AND DUST TEST

THIS REPORT HAS BEEN DELIMITED
AND CLEARED FOR PUBLIC RELEASE
UNDER DOD DIRECTIVE 5200.20 AND
NO RESTRICTIONS ARE IMPOSED UPON
ITS USE AND DISCLOSURE.

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.